Exhibit B

HARTCROWSER

Earth and Environmental Technologies

Volume I

Sediment Characterization Study of Local Sponsors' Berths; Columbia and Willamette River Navigation Channel Deepening; Longview and Kalama, Washington and Portland, Oregon

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1.0 INTRODUCTION

1.1 Project Description

This report presents the results of the sediment characterization study conducted at the Port of Longview and Port of Kalama, Washington, and the Port of Portland, Oregon (see Figure 1). This work was authorized by local port sponsors to support the proposed deepening of the Columbia and Willamette River Navigation Channels. Presently, at many of the grain and container handling facilities at the ports, the water depth at berths is less than the proposed navigational depth and will not accommodate deeper draft vessels once the federal navigational channel is deepened. The purpose of this report is to provide preliminary dredge prism characterization in support of the permitting process for the dredging of the Columbia River Navigation Channel. To meet this objective, two sediment cores were collected at each Dredge Material Management Unit (DMMU) identified in the project area. One composite sediment sample from each DMMU was analyzed for chemical, conventional, and grain size parameters as defined in the Draft Dredge Material Evaluation Framework for the Lower Columbia River Management Area (LCRMA) (Corps *et al.*, 1998).

The proposed Columbia River deepening project will deepen both the Columbia and Willamette River navigation channels. The proposed depth for Columbia River navigation channel is -43 feet (ft) Columbia River Datum (CRD) plus a 5 ft overdepth (-48 ft total depth); while the Willamette River navigation channel is proposed to be deepened to -43 ft CRD plus a 2 ft overdepth (-45 ft total depth).

Within the Portland Harbor, dredging is proposed along Berth 501, Berth 401, Terminal 6, and Irving Street Terminal to maintain future berthing elevations of -43 feet CRD. At the Port of Kalama, dredging is proposed along the Harvest States Grain Terminal and the Peavey Grain Terminal to maintain berth elevation of -43 feet CRD. At the Port of Longview, dredging is proposed along the Longview Grain Wharf to maintain berth elevation of -43 feet CRD. Deepening is not required at the Louis Dreyfuss Terminal in Portland and the United Grain Terminal in Vancouver based on recent hydrographic survey information.

An additional part of this study involved the collection of surface sediment grab samples at twelve deep water locations in the Willamette River (Figures 2 and 3). These samples were collected to supplement sediment sampling conducted in 1997 by the US Army Corps of Engineers (Corps) as part of the Willamette River channel deepening feasibility study. A sediment sample from each grab sample was analyzed for chemical, conventional, and grain size parameters as defined in LCRMA (Corps *et al.*, 1998).

1.2 Report Organization

The main body of this report discusses the results of the sediment characterization study and possible dredge disposal options based on comparison of the sediment characterization data with the LCRMA screening levels (LCRMA-SLs) (Corps *et al.*, 1998). Supporting discussions within the text include sediment sampling locations and any modifications to the Corps approved (pers. comm. Mark Siipola; September, 1998) Sampling and Analysis Plan (SAP) (Hart Crowser, September 3, 1998). The attached appendix presents supporting information including chemical data quality review (Appendix A). Additional procedural details are presented in the SAP (Hart Crowser, September, 1998) that guided this work. Copies of the laboratory certificates of analyses are provided in a separate volume (Appendix B).

2.0 SEDIMENT SAMPLING AND HANDLING

Except for modifications discussed in Section 2.2, all sediment sampling and handling activities were performed in accordance with the Corps-approved SAP (Hart Crowser, 1998). The sampling program was conducted in accordance with LCRMA guidelines to provide full characterization of dredged material.

2.1 Sampling Locations and Methods

Sediment samples were collected from each of the locations shown on Figures 1 through 3 on September 14 through 17, 1998. Tables 1 and 3 present the coordinates of the sampling locations, description of the sediment sample, the sediment elevation (in feet CRD) at the time of sampling, and the length of the collected sediment sample. Surface sediment samples were collected from each of the locations shown on Figures 2 and 3. Tables 2 and 4 present the coordinates of the sampling locations, description of the sediment sample, and the sediment elevation (in feet CRD) at the time of sampling.

2.2 *Modifications to the Sampling and Analysis Plan*

There were several modifications made to the SAP. Recent bathymetric information indicated that the water depths at the Louis Dreyfuss Terminal at the Port of Portland and the United Grain Terminal at the Port of Vancouver were sufficient to meet navigational requirements and do not require maintenance dredging. Therefore, these terminals were not sampled in this study. Several of the sediment cores (B501-02, B401-01, HS-01, PG-01, and LG-01) were collected in areas with a higher river bed elevation than was initially expected. Although the cores were collected to the maximum depth possible with the vibracore (6 foot cores), these cores are nevertheless a foot shy of the target maximum penetration depth (-45 feet). Therefore, archived sediment samples to characterize the sediment that would be exposed after dredging were not collected at these locations. The other sample locations (B501-01, B401-02, HS-02, PG-02, and LG-02), the riverbed elevation allowed the collection of an archived bottom sediment sample. Additionally, the proposed sediment sampling locations at the Irving Street Terminal were adjusted because a vessel at the berth restricted access to the original proposed locations. Sediment cores were collected near the bow and stern of the vessel (Table 3).

A final minor modification to the SAP was that all the sediment cores were processed in the field immediately upon retrieval. Therefore, there was no need to cap and store the sediment cores prior to processing on land.

2.3 *Data Quality Review*

A standard data quality review was performed by Hart Crowser on the analytical data package submitted by Columbia Analytical Services and is included as Appendix A of this report. Copies of the laboratory certificates of analyses are provided in a separate volume (Appendix B).

The data quality review concluded that the chemistry data are acceptable for evaluation of sediment disposal options. However, the sample quantitation limit (SQL) for various analytes exceeded the LCRMA-SLs for several of the submitted sediment samples (B401-C1, IS-C1, Grab 5, and Grab 6). If chemical SQLs are higher than the screening levels for a given matrix, a quantitative statement regarding the potential risk for those chemicals cannot be determined. The primary uncertainty is that a chemical may be present above a concentration believed to elicit adverse effects, but below the SQL that could be detected by the analytical method employed. However, for these sediment samples (with the exception of Grab 6), there were other detected chemicals that exceeded LCRMA SLs and in some cases maximum levels (MLs), and the determination of disposal options under Tier II of the LCRMA did not have to be based on SQL exceedences.

3.0 COMPARISON OF CHEMISTRY RESULTS WITH LCRMA SCREENING LEVELS

Sediment chemistry results for the proposed dredge prisms at Berth 501, Terminal 6, Berth 401, and Irving Street Terminal at the Port of Portland; the Harvest States Grain Terminal and the Peavey Grain Terminal at the Port of Kalama; and the Longview Grain Terminal at the Port of Longview; as well as the sediment grab samples from the deep water locations in the Willamette River; were compared to sediment screening levels set forth in the LCRMA for evaluation of suitability for open-water disposal. Two LCRMA sediment quality criteria are provided for comparison with sediment analytical data. First, a lower Screening Level (SL) has been identified for each chemical which corresponds to concentrations below which sediments are acceptable for open water disposal. Second, a higher maximum level (ML) has been defined for each chemical which corresponds to concentrations above which sediments would be unacceptable for unconfined, open water disposal. As per LCRMA guidance, the SL for tributyltin (TBT) is based on a pore water concentration rather than a bulk sediment concentration. Sediment chemistry results are listed in Tables 5 through 9.

3.1 Berth 501

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 5). For DMMU 1/ B501 (composite sediment sample B501-C1), no metals, semivolatile organic compounds, PCBs, and butyltins were detected above their respective SLs. The only chemical detected above its SL in this DMMU was total DDT. The detected concentration of total DDT in this sample (14.9 μg/kg) slightly exceeded the LCRMA screening level for total DDT (6.9 μg/kg). Based on the exceedence of the LCRMA SL for total DDT, further evaluation of the dredge material from this DMMU is required to determine appropriate disposal options.

Sediments from DMMU 2/ B501 (composite sediment sample B501-C2) were determined to be suitable for unconfined open-water disposal as all detected compounds were at concentrations below corresponding LCRMA SLs.

3.2 Terminal 6

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 5). For DMMU 1/ T6 (composite sediment sample T6-C1), no semivolatile organic compounds, PCBs, and pesticides were detected above their respective SLs. The only chemical detected above its SL in this DMMU was TBT in pore water. The detected concentration of TBT in this sample (0.33 µg/L) exceeded the LCRMA screening level for TBT (0.15 µg/L). Based on the exceedence of the LCRMA SL for TBT, further evaluation of the dredge material from this DMMU is required to determine appropriate disposal options.

Sediments from DMMU 2/ T6 (composite sediment sample T6-C2) were determined to be suitable for unconfined open-water disposal as all detected compounds were at concentrations below corresponding LCRMA SLs.

3.3 Berth 401

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 6). For DMMU 1/ B401 (composite sediment sample B401-C1), no metals, volatile organic compounds, or PCBs were detected above their respective SLs. Two PAHs (Pyrene and Fluoranthene) slightly exceeded their respective SLs. The detected concentration of total DDT exceeded the ML. In addition, the sample quantitation limits (SQLs) for several phenols and semivolatile compounds exceeded their respective SLs making comparison with SLs uncertain. Based on the exceedences of various LCRMA SLs and the ML for total DDT, further evaluation of the dredge material from this DMMU is required to determine appropriate disposal options.

Sediments from DMMU 2/ B401 (composite sediment sample B401-C2) were determined to be suitable for unconfined open-water disposal. All measured compounds were at concentrations below the LCRMA SLs.

3.4 Irving Street Terminal

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 6). For DMMU 1/ IS (composite sediment sample IS-C1), six PAHs were detected above LCRMA MLs and seven PAHs were detected above the LCRMA SLs but below the corresponding MLs. The detected concentration of total PCBs also exceeded the LCRMA ML. In addition, the sample quantitation limits (SQLs) for the pesticides total DDT and chlordane exceeded their respective SLs making comparison with SLs uncertain. Based on the exceedences of the LCRMA SLs and MLs at this DMMU, further evaluation of the dredge material is required to determine appropriate disposal options.

The detected compounds in sediments from DMMU 2/ IS (composite sediment sample IS-C2) were measured at concentrations below the corresponding LCRMA SLs except for total PCB. The detected concentration of total PCBs in sample IS-C2 (710 µg/kg) exceeded the LCRMA SL (130 µg/kg) for total PCB. Based on the exceedence of the LCRMA SL for PCBs, further evaluation of the dredge material is required to determine appropriate disposal options.

3.5 Harvest States Grain Terminal

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 7). Sediments from DMMU 1/ HS (composite sediment sample HS01-C1) were determined to be suitable for unconfined open-water disposal as all detected compounds were measured at concentrations below the corresponding LCRMA SLs.

All detected compounds in sediments from DMMU 2/ HS (composite sediment sample HS01-C2) were measured at concentrations below the corresponding LCRMA SLs. Sediments from DMMU 2/ HS were determined to be suitable for unconfined open-water disposal.

3.6 Peavey Grain Terminal

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 7). Sediments from DMMU 1/ PG (composite sediment sample PG01-C1) were determined to be suitable for unconfined open-water disposal as all detected compounds were measured at concentrations below the corresponding LCRMA SLs.

Sediments from DMMU 2/ PG (composite sediment sample PG01-C2) were determined to be suitable for unconfined open-water disposal as all detected compounds were measured at concentrations below the corresponding LCRMA SLs.

3.7 *Longview Grain Wharf*

Two sediment cores were collected at this location and were composited into two depth integrated samples (Table 8). Sediments from DMMU 1/ LG (composite sediment sample LG01-C1) were determined to be suitable for unconfined open-water disposal as all detected compounds were measured at concentrations below the corresponding LCRMA SLs.

Sediments from DMMU 2/ LG (composite sediment sample LG01-C2) were determined to be suitable for unconfined open-water disposal as all detected compounds were measured at concentrations below the corresponding LCRMA SLs.

3.8 *Sediment Grab Samples*

The analytical results from the surface sediment grab samples were compared to sediment screening levels set forth in the LCRMA (Table 9). As discussed previously, these samples were collected from deep water locations in the Willamette River to supplement the Corps 1997 channel deepening feasibility study. The results of the comparison of analytical data with LCRMA SLs are summarized below.

GRAB 1. All detected compounds in surface sediment sample Grab 1 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 2. Detected compounds in sediments from surface sediment sample Grab 2 were measured at concentrations below the corresponding LCRMA SLs except for total DDT. The concentration of total DDT detected in Grab 2 (15.5 µg/kg) exceeded the LCRMA SL for total DDT (6.9 µg/kg).

GRAB 3. All detected compounds in surface sediment sample Grab 3 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 4. Detected compounds in sediments from Grab 4 were measured at concentrations below the corresponding LCRMA SLs except for several PAHs and total DDT. The concentrations of three PAHs (fluoranthene, 2600 µg/kg; indeno(1,2,3-cd)pyrene, 980 µg/kg; and pyrene, 3000 µg/kg) in sample Grab 4 exceeded their corresponding LCRMA SLs (1700 µg/kg, 600 µg/kg, and 2600 µg/kg). The LCRMA SL for total DDT (6.9 µg/kg) was exceeded in sample Grab 4 (65.9 µg/kg).

GRAB 5. In this sample, the concentrations of fourteen PAHs were detected above the LCRMA MLs. The detected concentration of total DDT in this sample (25 µg/kg) exceeded the LCRMA SL (6.9 µg/kg). In addition, the SQLs for two PAHs, all of the phenols, all of the phthalates, and all of the semivolatile organic compounds exceeded LCRMA SLs and in some cases MLs making comparison with SLs and MLs uncertain.

GRAB 6. Detected compounds in sediments from Grab 6 were measured at concentrations below the corresponding LCRMA SLs. However, the SQLs for 2,4-dimethylphenol, hexachlorobenzene, hexachlorobutadiene, and N-nitrosodiphenylamine exceeded LCRMA SLs making comparison with SLs uncertain.

GRAB 7. All detected compounds in surface sediment sample Grab 7 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 8. All detected compounds in surface sediment sample Grab 8 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 9. All detected compounds in surface sediment sample Grab 9 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 10. All detected compounds in surface sediment sample Grab 10 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 11. All detected compounds in surface sediment sample Grab 11 were measured at concentrations below the corresponding LCRMA SLs.

GRAB 12. All detected compounds in surface sediment sample Grab 1 were measured at concentrations below the corresponding LCRMA SLs.

4.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Port of Portland for specific application to the referenced properties. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

Please feel free to contact us with any questions or comments.

Sincerely,

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5.0 REFERENCES

Corps et al., 1998. Dredged Material Evaluation Framework, Lower Columbia River Management Area. Draft April 1998.

Hart Crowser, 1998. Sampling and Analysis Plan, Sediment Testing for Full Characterization of Proposed Dredged Material, Longview, Kalama, and Vancouver, Washington, and Portland, Oregon. September 3, 1998.

Table 1 - Discrete Core Sample Description

Core Sample Identification	Sample Depth Interval in Feet [1]	Visual Sediment Description
Berth 501		
B501-01	0.0 to 6.0	Brown-gray, slightly silty, medium SAND with sheen at four feet
B501-02	0.0 to 5.0	Brown-gray, slightly silty, medium SAND
Terminal 6		
T6-01	0.0 to 3.5	Olive, slightly sandy SILT
	3.5 to 5.0	Olive-black, silty SAND with wood debris
T6-02	0.0 to 3.5	Olive, slightly sandy SILT
	3.5 to 6.0	Olive-black, silty SAND with wood debris
T6-03	0.0 to 3.5	Olive, slightly sandy SILT
	3.5 to 5.0	Olive-black, silty SAND with wood debris
Berth 401		
B401-01	0.0 to 1.0	Gray-brown, sandy SILT
	1.0 to 3.0	Gray-brown, sandy SILT with wood debris and silt laminates
	3.0 to 5.0	Gray, medium SAND
B401-02	0.0 to 1.0	Gray-brown, sandy SILT
	1.0 to 3.0	Gray-brown, sandy SILT with wood debris and silt laminates
	3.0 to 4.5	Gray, medium SAND
Irving Street		
IS-01	0.0 to 2.0	Olive, loose, SILT with wood fragments
	2.0 to 5.9	Black, medium coarse SAND
IS-02	0.0 to 2.0	Olive, loose, SILT with wood fragments and occasional sheen
	2.0 to 5.8	Black, medium coarse SAND
Harvest States		
HS-01	0 to 1.0	Olive, slightly silty SAND
	1.0 to 5.0	Gray, slightly silty SAND
HS-02	0 to 1.0	Olive, slightly silty SAND
	1.0 to 6.0	Gray, slightly silty SAND
Peavey Grain		
PG-01	0 to 2.0	Brown, slightly gravelly SAND
	2.0 to 5.0	Brown, gravelly SAND
PG-02	0 to 2.0	Brown, slightly gravelly SAND
	2.0 to 5.0	Brown, gravelly SAND
Longview Grain		
LG-01	0 to 3.0	Olive, silty SAND
	3.0 to 6	Dark gray, slightly silty SAND
LG-02	0 to 3.0	Olive, silty SAND
	3.0 to 6	Dark gray, slightly silty SAND

Notes:
1. Depth is not compaction corrected.

Table 2 - Surface Sediment Sample Description

Grab Sample Identification	Sample Depth Interval in Feet	Visual Sediment Description
Grab-01	0.67	Olive-gray, slightly sandy SILT, worm burrows
Grab-02	0.67	Olive-gray, slightly sandy SILT to 4"; Black med-fine SAND to 8", worm burrows
Grab-03	0.67	Olive-gray, very sandy SILT to 4"; Black med-fine slightly silty SAND to 8", worm burrows
Grab-04	0.67	Olive-brown SILT, slight sheen
Grab-05	0.67	Brown SILT to 2"; Brown-black coarse SAND to 8", slight sheen
Grab-06	0.67	Black, slightly silty SAND
Grab-07	0.67	Brown-olive, sandy SILT with wood debris and worm burrows
Grab-08	0.67	Gray-olive, loose SILT
Grab-09	0.67	Olive, loose SILT to 7", Black coarse SAND to 8"
Grab-10	0.67	Olive, loose SILT to 7"; Black coarse SAND to 8"
Grab-11	0.67	Olive, loose SILT with wood debris and worm burrows
Grab-12	0.67	Olive, loose SILT to 4"; Black med-coarse SAND to 8", worm burrows

Table 3 - Summary of Field Sampling Results for Core Samples

Sample Location	North Latitude	West Longitude	Mudline Elevation in Feet CRD	Core Penetration in Feet	Sample Recovery in Feet	Estimated Core Compaction in Percent	Core Penetration Elevation in Feet CRD	Notes
Berth 501								
B501-01	45° 38.531'	122° 46.359'	-40.0	6.0	6.0	0.0	-46.0	
B501-02	45° 38.486'	122° 46.437'	-39.0	6.0	5.0	16.7	-44.8	Full dredge depth not achieved.
Terminal 6								
T6-01	45° 38.528'	122° 45.010'	-40.0	6.0	5.0	16.7	-45.8	
T6-02	45° 38.449'	122° 44.926'	-40.0	6.0	6.0	0.0	-46.0	
T6-03	45° 38.314'	122° 44.727'	-40.0	5.0	5.0	0.0	-45.0	No archive sample collected from core.
Berth 401								
B401-01	45° 36.318'	122° 46.820'	-40.0	6.0	5.0	16.7	-45.8	
B401-02	45° 36.292'	122° 46.813'	-41.0	6.0	4.5	25.0	-46.6	
Irving Street								
IS-01	45° 32.091'	122° 40.478'	-40.5	6.0	5.9	1.7	-46.5	Vessel at berth. Sample collected near bow of vessel.
IS-02	45° 32.413'	122° 40.590'	-40.5	6.0	5.8	3.3	-46.5	Vessel at berth. Sample collected near stern of vessel.
Harvest States								
HS-01	45° 59.012'	122° 50.051'	-42	6.0	5.0	16.7	-47.8	Full dredge depth not achieved.
HS-02	45° 59.007'	122° 50.035'	-42	6.0	6.0	0.0	-48.0	
Peavey Grain								
PG-01	46° 01.560'	122° 52.063'	-41	5.0	5.0	0.0	-46.0	Full dredge depth not achieved.
PG-02	46° 01.569'	122° 52.047'	-41	5.0	5.0	0.0	-46.0	Full dredge depth not achieved.
Longview Grain								
LG-01	46° 06.271'	122° 57.121'	-39	6.0	6.0	0.0	-45.0	Full dredge depth not achieved.
LG-02	46° 06.275'	122° 57.110'	-40	6.0	6.0	0.0	-46.0	Full dredge depth not achieved.

(NAD 83)

Table 4 - Summary of Field Sampling Results for Surface Sediment Samples

Sample Location	North Latitude	West Longitude	Mudline Elevation in Feet CRD	Approximate River Mile
Grab-01	45° 35.311'	122° 46.800'	-70	4.5
Grab-02	45° 35.980'	122° 46.639'	-74	4.8
Grab-03	45° 35.665'	122° 46.378'	-78	5.1
Grab-04	45° 34.926'	122° 45.593'	-57	6.1
Grab-05	45° 34.955	122° 45.512'	-50	6.1
Grab-06	45° 34.886'	122° 45.333'	-48	6.3
Grab-07	45° 34.394'	122° 44.259'	-63	7.3
Grab-08	45° 34.019'	122° 43.821'	63	7.9
Grab-09	45° 33.225'	122° 42.203'	-73	9.4
Grab-10	45° 33.103'	122° 41.914'	-64.5	9.7
Grab-11	45° 32.639'	122° 41.403'	-76	10.5
Grab-12	45° 32.356'	122° 41.021'	-66	10.8

(NAD 27)

Table 5 - Draft Analytical Results for Sediment Samples; Berth 501 and Terminal 6

Sample ID			B501-C1	B501-C2	T6-C1	T6-C2
Lab ID			K9806351-009	K9806351-010	K9806423-001	K9806423-002
Sampling Date	LCRMA	LCRMA	9/14/98	9/14/98	9/16/98	9/16/98
Sampling Depth Interval	SL	ML	0 to 3 ft	3 to 5 ft	0 to 3 ft	3 to 5 ft
Conventionals						
Ammonia as Nitrogen			70.5	119	140	83.7
Carbon, Total Organic (TOC)			0.54	0.52	0.87	0.64
Solids, Total			62.1	69.6	58.9	63.6
Solids, Total Volatile			5.72	2.79	4.67	3.27
Sulfide, Total			41	45	13.1	100
Metals in mg/kg						
Antimony, Total	150	200	0.05	0.03	0.05	0.04 U
Arsenic, Total	57	700	2.6	1.2	2	2
Cadmium, Total	5.1	14	0.85	0.44	0.64	0.78
Chromium, Total			16.3	13.3	11.7	11.2
Copper, Total	390	1300	19.7	14.7	18.3	16.4
Lead, Total	450	1200	18.2	11.1	10	9.65
Mercury, Total	0.41	2.3	0.11	0.05	0.07	0.06
Nickel, Total	140	370	16.2	16.1	12.1	11.1
Silver, Total	6.1	8.4	0.18	0.16	0.13	0.14
Zinc, Total	410	3800	112	75.5	88	101
Organometallics in µg/L						
Tri-n-butyltin	0.15		0.03		$\boxed{0.33}$	
LPAHs in µg/kg						
Acenaphthene	500	2000	33	28	20 U	20 U
Acenaphthylene	560	1300	20 U	20 U	20 U	20 U
Anthracene	960	13000	35	20 U	20 U	31
Fluorene	540	3600	20 U	22	20 U	23
Naphthalene	2100	2400	50	20 U	20 U	20 U
Phenanthrene	1500	21000	250	140	56	120
Total LPAHs	5200	29000	368	190	56	174
HPAHs in µg/kg						
Benz(a)anthracene	1300	5100	130	34	52	56
Benzo(a)pyrene	1600	3600	180	38	35	40
Benzo(b)fluoranthene			120	32	42	49
Benzo(g,h,i)perylene	670	3200	100	23	20 U	28
Benzo(k)fluoranthene			100	26	36	47
Chrysene	1400	21000	160	42	55	86
Dibenz(a,h)anthracene	230	1900	20	20 U	20 U	20 U
Fluoranthene	1700	30000	300	93	120	170
Indeno(1,2,3-cd)pyrene	600	16000	130	30	23	38
Pyrene	2600	16000	390	120	110	140
Total Benzofluoranthenes	3200	9900	220	58	78	96
Total HPAHs	12000	69000	1630	438	473	654
Phenols in µg/kg						
2,4-Dimethylphenol	29	210	6 U	6 U	6 U	6 U
2-Methylphenol	63	77	6 U	6 U	6 U	6 U
4-Methylphenol	670	3600	77	20 U	20 U	20 U
Pentachlorophenol (PCP)	400	690	61 U	61 U	61 U	61 U
Phenol	420	1200	20 U	20 U	20 U	20 U
Phthalates in µg/kg						
Bis(2-ethylhexyl) Phthalate	8300		56	36	450	30
Butyl Benzyl Phthalate	970		20 U	20 U	190	20 U
Di-n-butyl Phthalate	5100		20 U	20 U	20 U	20 U

Table 5 - Draft Analytical Results for Sediment Samples; Berth 501 and Terminal 6

Sample ID			B501-C1	B501-C2	T6-C1	T6-C2
Lab ID			K9806351-009	K9806351-010	K9806423-001	K9806423-002
Sampling Date	LCRMA	LCRMA	9/14/98	9/14/98	9/16/98	9/16/98
Sampling Depth Interval	SL	ML	0 to 3 ft	3 to 5 ft	0 to 3 ft	3 to 5 ft
Di-n-octyl Phthalate	6200		20 U	20 U	20 U	20 U
Diethyl Phthalate	1200		20 U	20 U	20 U	20 U
Dimethyl Phthalate	1400		20 U	20 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	100 U	100 U	100 U	100 U
Benzyl Alcohol	57	870	6 U	6 U	6 U	6 U
Dibenzofuran	540	1700	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	230	20 U	20 U	20 U	20 U
Hexachlorobutadiene	29	290	20 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	12 U	12 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			9.9	3.9	2 U	2 U
4,4'-DDE			5	2.6	2	2
4,4'-DDT			6.7 U	6.7 U	2 U	2 U
Total DDT	6.9	69	14.9	6.5	2	2
Aldrin	10		1.7 U	1.7 U	2 U	2 U
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	20 U	10 U	10 U
Aroclor 1242			22	10 U	10 U	10 U
Aroclor 1248			10 U	20 U	10 U	10 U
Aroclor 1254			20 U	15 U	10 U	10 U
Aroclor 1260			13	14	10 U	10 U
Total PCBs	130	3100	35	14	10 U	10 U
Chlordane	10					
Dieldrin	10		2.3 U	2.3 U	2 U	2 U
Endosulfan I					2 U	2 U
Endosulfan II					2 U	2 U
Endosulfan Sulfate					2 U	2 U
Endrin					2 U	2 U
Endrin Aldehyde					2 U	2 U
Endrin Ketone					2 U	2 U
Heptachlor	10		1.7 U	1.7 U	2 U	2 U
Heptachlor Epoxide					2 U	2 U
Methoxychlor					4 U	4 U
Toxaphene					30 U	30 U
alpha-BHC					2 U	2 U
alpha-Chlordane			1.7 U	1.7 U	2 U	2 U
beta-BHC					2 U	2 U
delta-BHC					2 U	2 U
gamma-BHC (Lindane)	10		1.7 U	1.7 U	2 U	2 U
gamma-Chlordane			1.7 U	1.7 U	2 U	2 U

Notes: Exceeds LCRMA SL

SQLs Exceeds LCRMA SL

Table 6 - Analytical Results for Sediment Samples; Berth 401 and Irving St.

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	B401-C1 K9806351-012 9/14/98 0 to 3 ft	B401-C2 K9806351-013 9/14/98 3 to 5 ft	IS-C1 K9806410-008 9/15/98 0 to 3 ft	IS-C2 K9806410-009 9/15/98 3 to 5 ft
Conventionals						
Ammonia as Nitrogen			209	154	65 UJ/J	100 UJ/J
Carbon, Total Organic (TOC)			1.63	0.53	1.03	0.91
Solids, Total			54	70.4		
Solids, Total Volatile			6.2	2.64		
Sulfide, Total			28	32	58	2
Metals in mg/kg						
Antimony, Total	150	200	0.02 U	0.03	0.19 UJ/J	0.26 UJ/J
Arsenic, Total	57	700	1.3	1	1.9	2.1
Cadmium, Total	5.1	14	0.33 J	0.14 J	0.26	0.26
Chromium, Total			16.1	10.9	19.1	47.8
Copper, Total	390	1300	21.8	14.4	26.6 UJ/J	25.6 UJ/J
Lead, Total	450	1200	12.4	9.8	29	367
Mercury, Total	0.41	2.3	0.21	0.08	0.07	0.08
Nickel, Total	140	370	16.1	15.3	20.1	25.5
Silver, Total	6.1	8.4	0.2	0.12	0.18	0.2
Zinc, Total	410	3800	87.6	53.4	90.1	115
Organometallics in µg/L						
Tri-n-butyltin	0.15		0.04		0.05	
LPAHs in µg/kg						
Acenaphthene	500	2000	210	38	34	20 U
Acenaphthylene	560	1300	200 U	20 U	240	20 U
Anthracene	960	13000	250	46	2200	20 U
Fluorene	540	3600	200 U	27	190	20 U
Naphthalene	2100	2400	290	95	190	20 U
Phenanthrene	1500	21000	1100	260	6800	45
Total LPAHs	5200	29000	1850	466	9654	45
HPAHs in µg/kg						
Benz(a)anthracene	1300	5100	690	170	6400	37
Benzo(a)pyrene	1600	3600	710	220	7300	61
Benzo(b)fluoranthene			460	140	2900	31
Benzo(g,h,i)perylene	670	3200	380	140	4400	270
Benzo(k)fluoranthene			450	130	5100	26
Chrysene	1400	21000	740	190	8100	40
Dibenz(a,h)anthracene	230	1900	200 U	20 U	660	53
Fluoranthene	1700	30000	2200	430	16000	98
Indeno(1,2,3-cd)pyrene	600	16000	410	180	4600	360
Pyrene	2600	16000	2700	540	19000	110
Total Benzofluoranthenes	3200	9900	910	270	8000	57
Total HPAHs	12000	69000	8740	2140	74460	1086
Phenols in µg/kg						
2,4-Dimethylphenol	29	210	60 U	6 U	6 U	6 U
2-Methylphenol	63	77	60 U	6 U	6 U	6 U
4-Methylphenol	670	3600	200 U	23	44	52
Pentachlorophenol (PCP)	400	690	610 U	61 U	61 U	61 U
Phenol	420	1200	200 U	20 U	20 U	20 U
Phthalates in µg/kg						
Bis(2-ethylhexyl) Phthalate	8300		200 U	20 U	220	160
Butyl Benzyl Phthalate	970		240	20 U	28	20 U
Di-n-butyl Phthalate	5100		200 U	20 U	20 U	20 U

Table 6 - Analytical Results for Sediment Samples; Berth 401 and Irving St.

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	B401-C1 K9806351-012 9/14/98 0 to 3 ft	B401-C2 K9806351-013 9/14/98 3 to 5 ft	IS-C1 K9806410-008 9/15/98 0 to 3 ft	IS-C2 K9806410-009 9/15/98 3 to 5 ft
Di-n-octyl Phthalate	6200		200 U	20 U	20 U	20 U
Diethyl Phthalate	1200		200 U	20 U	20 U	20 U
Dimethyl Phthalate	1400		200 U	20 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	1000 U	100 U	100 U	100 U
Benzyl Alcohol	57	870	60 U	6 U	6 U	6 U
Dibenzofuran	540	1700	200 U	20 U	27	20 U
Hexachlorobenzene	22	230	200 U	20 U	20 U	20 U
Hexachlorobutadiene	29	290	200 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	120 U	12 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			14	5.1	20 U	2 U
4,4'-DDE			5.8	2.3 U	20 U	2 U
4,4'-DDT			460	6.7 U	20 U	2 U
Total DDT	6.9	69	479.8	5.1	20 U	2 U
Aldrin	10		1.7 U	1.7 U	2 U	2 U
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	10 U	10 U	10 U
Aroclor 1242			10 U	10 U	10 U	10 U
Aroclor 1248			10 U	10 U	10 U	10 U
Aroclor 1254			25 U	10 U	10 U	10 U
Aroclor 1260			32	12	7100	710
Total PCBs	130	3100	32	12	7100	710
Chlordane	10					
Dieldrin	10		2.3 U	2.3 U	65 U	2 U
Endosulfan I					20 U	2 U
Endosulfan II					20 U	2 U
Endosulfan Sulfate					20 U	2 U
Endrin					20 U	2 U
Endrin Aldehyde					190 U	15 U
Endrin Ketone					20 U	2 U
Heptachlor	10		1.7 U	1.7 U	2 U	2 U
Heptachlor Epoxide					2 U	2 U
Methoxychlor					40 U	4 U
Toxaphene					300 U	300 U
alpha-BHC					2 U	2 U
alpha-Chlordane			1.7 U	1.7 U	20 U	2 U
beta-BHC					2 U	2 U
delta-BHC					2 U	2 U
gamma-BHC (Lindane)	10		1.7 U	1.7 U	2 U	2 U
gamma-Chlordane			1.7 U	1.7 U	20 U	3 U

Notes: Exceeds LCRMA SL (solid box); SQLs Exceeds LCRMA SL (dotted box)

Exceeds LCRMA ML (double box)

Table 7 - Analytical Results for Sediment Samples; Harvest States and Peavey Grain

Sample ID			HS-01-C1	HS01-C2	PG01-C1	PG01-C2
Lab ID			K9806462-001	K9806462-002	K9806462-004	K9806462-005
Sampling Date	LCRMA	LCRMA	9/17/98	9/17/98	9/17/98	9/17/98
Sampling Depth Interval	SL	ML	0 to 3 ft	3 to 5 ft	0 to 3 ft	3 to 5 ft
Conventionals						
Ammonia as Nitrogen			7.6	20.8	0.4	2.8
Carbon, Total Organic (TOC)			0.05	0.07	0.1	0.05 U
Solids, Total			80.5	77	78.5	82.8
Solids, Total Volatile			1.01	1.11	1.28	1.07
Sulfide, Total			0.7 U	0.7 U	0.7 U	0.7 U
Metals in mg/kg						
Antimony, Total	150	200	0.04 UJ/J	0.04 UJ/J	0.04 UJ/J	0.04 UJ/J
Arsenic, Total	57	700	0.6 J	0.5 J	0.4 J	0.4 J
Cadmium, Total	5.1	14	0.18	0.1	0.08	0.03 J
Chromium, Total			4.7	3.6	3.6	1.6
Copper, Total	390	1300	7.5	11.3	8.4	9.2
Lead, Total	450	1200	2.26	1.14	1.83	1.01
Mercury, Total	0.41	2.3	0.02 U	0.02 U	0.02 U	0.02 U
Nickel, Total	140	370	6.5	5	6.2	4.7
Silver, Total	6.1	8.4	0.05	0.01 J	0.03 J	0.02 J
Zinc, Total	410	3800	27	16	20	14
Organometallics in µg/L						
Tri-n-butyltin	0.15		0.02 UJ/J		0.02 UJ/J	
LPAHs in µg/kg						
Acenaphthene	500	2000	20 U	68	20 U	20 U
Acenaphthylene	560	1300	20 U	20 U	20 U	20 U
Anthracene	960	13000	20 U	20 U	20 U	20 U
Fluorene	540	3600	20 U	20 U	20 U	20 U
Naphthalene	2100	2400	20 U	20 U	20 U	20 U
Phenanthrene	1500	21000	20 U	20 U	20 U	20 U
Total LPAHs	5200	29000	20 U	68	20 U	20 U
HPAHs in µg/kg						
Benz(a)anthracene	1300	5100	20 U	20 U	20 U	20 U
Benzo(a)pyrene	1600	3600	20 U	20 U	20 U	20 U
Benzo(b)fluoranthene			20 U	20 U	20 U	20 U
Benzo(g,h,i)perylene	670	3200	20 U	20 U	20 U	20 U
Benzo(k)fluoranthene			20 U	20 U	20 U	20 U
Chrysene	1400	21000	20 U	20 U	20 U	20 U
Dibenz(a,h)anthracene	230	1900	20 U	20 U	20 U	20 U
Fluoranthene	1700	30000	20 U	20 U	20 U	20 U
Indeno(1,2,3-cd)pyrene	600	16000	20 U	20 U	20 U	20 U
Pyrene	2600	16000	20 U	20 U	20 U	20 U
Total Benzofluoranthenes	3200	9900	20 U	20 U	20 U	20 U
Total HPAHs	12000	69000	20 U	20 U	20 U	20 U
Phenols in µg/kg						
2,4-Dimethylphenol	29	210	6 U	6 U	6 U	6 U
2-Methylphenol	63	77	6 U	6 U	6 U	6 U
4-Methylphenol	670	3600	20 U	20 U	20 U	20 U
Pentachlorophenol (PCP)	400	690	61 U	61 U	61 U	61 U
Phenol	420	1200	20 U	20 U	20 U	20 U
Phthalates in µg/kg						
Bis(2-ethylhexyl) Phthalate	8300		26	20 U	20 U	20 U
Butyl Benzyl Phthalate	970		20 U	20 U	20 U	20 U
Di-n-butyl Phthalate	5100		20 U	20 U	20 U	20 U

Table 7 - Analytical Results for Sediment Samples; Harvest States and Peavey Grain

Sample ID			HS-01-C1	HS01-C2	PG01-C1	PG01-C2
Lab ID			K9806462-001	K9806462-002	K9806462-004	K9806462-005
Sampling Date	LCRMA	LCRMA	9/17/98	9/17/98	9/17/98	9/17/98
Sampling Depth Interval	SL	ML	0 to 3 ft	3 to 5 ft	0 to 3 ft	3 to 5 ft
Di-n-octyl Phthalate	6200		20 U	20 U	20 U	20 U
Diethyl Phthalate	1200		20 U	20 U	20 U	20 U
Dimethyl Phthalate	1400		20 U	20 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	100 U	100 U	100 U	100 U
Benzyl Alcohol	57	870	6 U	6 U	6 U	6 U
Dibenzofuran	540	1700	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	230	20 U	20 U	20 U	20 U
Hexachlorobutadiene	29	290	20 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	12 U	12 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			3.3 U	3.3 U	3.3 U	3.3 U
4,4'-DDE			2.3 U	2.3 U	2.3 U	2.3 U
4,4'-DDT			6.7 U	6.7 U	6.7 U	6.7 U
Total DDT	6.9	69	6.7 U	6.7 U	6.7 U	6.7 U
Aldrin	10		1.7 U	1.7 U	1.7 U	1.7 U
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	10 U	10 U	10 U
Aroclor 1242			10 U	10 U	10 U	10 U
Aroclor 1248			10 U	10 U	10 U	10 U
Aroclor 1254			10 U	10 U	10 U	10 U
Aroclor 1260			10 U	10 U	10 U	10 U
Total PCBs	130	3100	10 U	10 U	10 U	10 U
Chlordane	10		2 U	2 U	2 U	2 U
Dieldrin	10		2.3 U	2.3 U	2.3 U	2.3 U
Endosulfan I						
Endosulfan II						
Endosulfan Sulfate						
Endrin						
Endrin Aldehyde						
Endrin Ketone						
Heptachlor	10		1.7 U	1.7 U	1.7 U	1.7 U
Heptachlor Epoxide						
Methoxychlor						
Toxaphene						
alpha-BHC						
alpha-Chlordane						
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)	10		1.7 U	1.7 U	1.7 U	1.7 U
gamma-Chlordane						

Notes: Exceeds LCRMA SL

SQLs Exceeds LCRMA SL

Table 8 - Analytical Results for Sediment Samples; Longview Grain

Sample ID			LG01-C1	LG01-C2
Lab ID			K9806462-007	K9806462-008
Sampling Date	LCRMA	LCRMA	9/15/98	9/15/98
Sampling Depth Interval	SL	ML	0 to 3 ft	3 to 5 ft
Conventionals				
Ammonia as Nitrogen			24.1	2.6
Carbon, Total Organic (TOC)			0.3	0.05 U
Solids, Total			68	75.3
Solids, Total Volatile			1.58	0.64
Sulfide, Total			5.93	0.71
Metals in mg/kg				
Antimony, Total	150	200	0.04 UJ/J	0.04 UJ/J
Arsenic, Total	57	700	0.5 J	0.2 J
Cadmium, Total	5.1	14	0.1	0.07
Chromium, Total			3.8	2.1
Copper, Total	390	1300	14.9	9.4
Lead, Total	450	1200	1.93	0.84
Mercury, Total	0.41	2.3	0.02 U	0.02 U
Nickel, Total	140	370	5.7	4.8
Silver, Total	6.1	8.4	0.04	0.02 J
Zinc, Total	410	3800	18	10
Organometallics in µg/L				
Tri-n-butyltin	0.15		0.02 UJ/J	
LPAHs in µg/kg				
Acenaphthene	500	2000	20 U	20 U
Acenaphthylene	560	1300	20 U	20 U
Anthracene	960	13000	20 U	20 U
Fluorene	540	3600	20 U	20 U
Naphthalene	2100	2400	20 U	20 U
Phenanthrene	1500	21000	20 U	20 U
Total LPAHs	5200	29000	20 U	20 U
HPAHs in µg/kg				
Benz(a)anthracene	1300	5100	20 U	20 U
Benzo(a)pyrene	1600	3600	20 U	20 U
Benzo(b)fluoranthene			20 U	20 U
Benzo(g,h,i)perylene	670	3200	20 U	20 U
Benzo(k)fluoranthene			20 U	20 U
Chrysene	1400	21000	20 U	20 U
Dibenz(a,h)anthracene	230	1900	20 U	20 U
Fluoranthene	1700	30000	36	20 U
Indeno(1,2,3-cd)pyrene	600	16000	20 U	20 U
Pyrene	2600	16000	24	20 U
Total Benzofluoranthenes	3200	9900	20 U	20 U
Total HPAHs	12000	69000	60	20 U
Phenols in µg/kg				
2,4-Dimethylphenol	29	210	6 U	6 U
2-Methylphenol	63	77	6 U	6 U
4-Methylphenol	670	3600	20 U	20 U
Pentachlorophenol (PCP)	400	690	61 U	61 U
Phenol	420	1200	20 U	20 U
Phthalates in µg/kg				
Bis(2-ethylhexyl) Phthalate	8300		20 U	20 U
Butyl Benzyl Phthalate	970		20 U	20 U
Di-n-butyl Phthalate	5100		20 U	20 U

Table 8 - Analytical Results for Sediment Samples; Longview Grain

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	LG01-C1 K9806462-007 9/15/98 0 to 3 ft	LG01-C2 K9806462-008 9/15/98 3 to 5 ft
Di-n-octyl Phthalate	6200		20 U	20 U
Diethyl Phthalate	1200		20 U	20 U
Dimethyl Phthalate	1400		20 U	20 U
Semivolatiles in µg/kg				
Benzoic Acid	650	760	100 U	100 U
Benzyl Alcohol	57	870	6 U	6 U
Dibenzofuran	540	1700	20 U	20 U
Hexachlorobenzene	22	230	20 U	20 U
Hexachlorobutadiene	29	290	20 U	20 U
N-Nitrosodiphenylamine	28	130	12 U	12 U
Volatiles in µg/kg				
1,2-Dichlorobenzene	35	110	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U
Pesticide/PCBs in µg/kg				
4,4'-DDD			3.3 U	3.3 U
4,4'-DDE			2.3 U	2.3 U
4,4'-DDT			6.7 U	6.7 U
Total DDT	6.9	69	6.7 U	6.7 U
Aldrin	10		1.7 U	1.7 U
Aroclor 1016			10 U	10 U
Aroclor 1221			10 U	10 U
Aroclor 1232			10 U	10 U
Aroclor 1242			10 U	10 U
Aroclor 1248			10 U	10 U
Aroclor 1254			10 U	10 U
Aroclor 1260			10 U	10 U
Total PCBs	130	3100	10 U	10 U
Chlordane	10		2 U	2 U
Dieldrin	10		2.3 U	2.3 U
Endosulfan I				
Endosulfan II				
Endosulfan Sulfate				
Endrin				
Endrin Aldehyde				
Endrin Ketone				
Heptachlor	10		1.7 U	1.7 U
Heptachlor Epoxide				
Methoxychlor				
Toxaphene				
alpha-BHC				
alpha-Chlordane				
beta-BHC				
delta-BHC				
gamma-BHC (Lindane)	10		1.7 U	1.7 U
gamma-Chlordane				

Notes: Exceeds LCRMA SL

SQLs Exceeds LCRMA SL

Table 9 - Analytical Results for Sediment Samples; Willamette River Surface Sediment Samples

Sample ID			Grab 1	Grab 2	Grab 3	Grab 4
Lab ID			K9806351-001	K9806351-002	K9806351-003	K9806351-004
Sampling Date	LCRMA	LCRMA	9/14/98	9/14/98	9/14/98	9/14/98
Sampling Depth Interval	SL	ML	0 to 10 cm	0 to 10 cm	0 to 10 cm	0 to 10 cm
Conventionals						
Ammonia as Nitrogen			161	83.7	29.5	128
Carbon, Total Organic (TOC)			1.98	1.38	1.03	2.27
Solids, Total			44	50.7	57.5	38.6
Solids, Total Volatile			8.5	8.31	4.97	9.01
Sulfide, Total			56	100	52	7
Metals in mg/kg						
Antimony, Total	150	200	0.02 U	0.02	0.02 U	0.02
Arsenic, Total	57	700	1.8	1.8	1.8	1.8
Cadmium, Total	5.1	14	0.27 J	0.22 J	0.16 J	0.2 J
Chromium, Total			19.5	17.7	14.3	21.2
Copper, Total	390	1300	26.2	22.7	18.3	26.2
Lead, Total	450	1200	17.7	13.9	9.58	17.7
Mercury, Total	0.41	2.3	0.07	0.05	0.03 J	0.07
Nickel, Total	140	370	15.8	16.1	15.2	16.3
Silver, Total	6.1	8.4	0.2	0.2	0.16	0.24
Zinc, Total	410	3800	70.1	66	52.3	67.9
Organometallics in µg/L						
Tri-n-butyltin	0.15		0.05	0.05	0.02 U	0.02 U
LPAHs in µg/kg						
Acenaphthene	500	2000	20 U	26	20 U	250
Acenaphthylene	560	1300	20 U	21	20 U	90
Anthracene	960	13000	32	33	25	310
Fluorene	540	3600	20 U	20 U	20	180
Naphthalene	2100	2400	20 U	20 U	20 U	160
Phenanthrene	1500	21000	130	100	88	1200
Total LPAHs	5200	29000	162	180	133	2190
HPAHs in µg/kg						
Benz(a)anthracene	1300	5100	180	210	81	1200
Benzo(a)pyrene	1600	3600	230	290	110	1500
Benzo(b)fluoranthene			210	220	89	1100
Benzo(g,h,i)perylene	670	3200	150	150	72	620
Benzo(k)fluoranthene			150	160	69	920
Chrysene	1400	21000	190	210	94	1200
Dibenz(a,h)anthracene	230	1900	51	40	20 U	140
Fluoranthene	1700	30000	350	380	200	2600
Indeno(1,2,3-cd)pyrene	600	16000	220	220	100	980
Pyrene	2600	16000	330	430	250	3000
Total Benzofluoranthenes	3200	9900	360	380	158	2020
Total HPAHs	12000	69000	2061	2310	1065	13260
Phenols in µg/kg						
2,4-Dimethylphenol	29	210	6 U	6 U	6 U	6 U
2-Methylphenol	63	77	6 U	6 U	6 U	6 U
4-Methylphenol	670	3600	20 U	20 U	20 U	20 U
Pentachlorophenol (PCP)	400	690	61 U	61 U	61 U	61 U
Phenol	420	1200	20 U	20 U	20 U	20 U
Phthalates in µg/kg						
Bis(2-ethylhexyl) Phthalate	8300		400	280	200	470
Butyl Benzyl Phthalate	970		21	25	26	55
Di-n-butyl Phthalate	5100		20 U	20 U	20 U	20 U

Table 9 - Analytical Results for Sediment Samples; Willamette River Surface Sediment Samples

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	Grab 1 K9806351-001 9/14/98 0 to 10 cm	Grab 2 K9806351-002 9/14/98 0 to 10 cm	Grab 3 K9806351-003 9/14/98 0 to 10 cm	Grab 4 K9806351-004 9/14/98 0 to 10 cm
Di-n-octyl Phthalate	6200		20 U	20 U	20 U	20 U
Diethyl Phthalate	1200		20 U	20 U	20 U	20 U
Dimethyl Phthalate	1400		20 U	20 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	100 U	100 U	100 U	100
Benzyl Alcohol	57	870	12	6 U	6 U	15
Dibenzofuran	540	1700	20 U	20 U	20 U	45
Hexachlorobenzene	22	230	20 U	20 U	20 U	20 U
Hexachlorobutadiene	29	290	20 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	12 U	12 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			3.3 U	3.3 U	3.3 U	11
4,4'-DDE			3.5	2.5	2.3 U	5.9
4,4'-DDT			6.7 U	13	6.7 U	49
Total DDT	6.9	69	3.5	15.5	6.7 U	65.9
Aldrin	10		1.7 U	1.7 U	1.7 U	2.2
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	10 U	10 U	10 U
Aroclor 1242			10 U	10 U	10 U	10 U
Aroclor 1248			10 U	10 U	10 U	10 U
Aroclor 1254			10 U	10 U	10 U	15 U
Aroclor 1260			13	10 U	10 U	13
Total PCBs	130	3100	13	10 U	10 U	13
Chlordane	10					
Dieldrin	10		2.3 U	2.3 U	2.3 U	2.3 U
Endosulfan I						
Endosulfan II						
Endosulfan Sulfate						
Endrin						
Endrin Aldehyde						
Endrin Ketone						
Heptachlor	10		1.7 U	1.7 U	1.7 U	1.7 U
Heptachlor Epoxide						
Methoxychlor						
Toxaphene						
alpha-BHC						
alpha-Chlordane			1.7 U	1.7 U	1.7 U	1.7 U
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)	10		1.7 U	1.7 U	1.7 U	1.7 U
gamma-Chlordane			1.7 U	1.7 U	1.7 U	1.7 U

Notes: Exceeds LCRMA SL

SQLs Exceeds LCRMA SL

Table 9 - Analytical Results for Sediment Samples; Willamette River Surface Sediment Samples

Sample ID			Grab 5		Grab 6		Grab 7		Grab 8	
Lab ID			K9806351-005		K9806351-006		K9806351-007		K9806351-008	
Sampling Date	LCRMA	LCRMA	9/14/98		9/14/98		9/14/98		9/14/98	
Sampling Depth Interval	SL	ML	0 to 10 cm		0 to 10 cm		0 to 10 cm		0 to 10 cm	
Conventionals										
Ammonia as Nitrogen			14.2		15.3		72.4		122	
Carbon, Total Organic (TOC)			0.81		0.65		2.06		1.41	
Solids, Total			71.7		76.6		53.3		40	
Solids, Total Volatile			2.51		3.34		7.32		7.59	
Sulfide, Total			6		1		7		90	
Metals in mg/kg										
Antimony, Total	150	200	0.02	U	0.02	U	0.02	U	0.02	
Arsenic, Total	57	700	1.3		0.7		1.3		1.4	
Cadmium, Total	5.1	14	0.11	J	0.09	U	0.21	J	0.21	J
Chromium, Total			9.3		9.9		18.3		21.4	
Copper, Total	390	1300	13.1		12.3		25.5		48	
Lead, Total	450	1200	5.6		4.64		12.7		15.2	
Mercury, Total	0.41	2.3	0.02	J	0.02	U	0.05		0.07	
Nickel, Total	140	370	12.7		12.6		16.2		18.3	
Silver, Total	6.1	8.4	0.12		0.08		0.18		0.3	
Zinc, Total	410	3800	40		38.6		58.3		73.9	
Organometallics in µg/L										
Tri-n-butyltin	0.15		0.02	U	0.02		0.07		0.12	
LPAHs in µg/kg										
Acenaphthene	500	2000	31000		160		20	U	20	U
Acenaphthylene	560	1300	10000	U	100	U	20	U	20	U
Anthracene	960	13000	26000		340		20	U	20	U
Fluorene	540	3600	14000		140		20	U	20	U
Naphthalene	2100	2400	10000	U	100	U	20	U	20	U
Phenanthrene	1500	21000	84000		1300		23		33	
Total LPAHs	5200	29000	155000		1940		23		33	
HPAHs in µg/kg										
Benz(a)anthracene	1300	5100	39000		340		20		28	
Benzo(a)pyrene	1600	3600	39000		340		22		29	
Benzo(b)fluoranthene			19000		180		23		34	
Benzo(g,h,i)perylene	670	3200	18000		170		20	U	20	U
Benzo(k)fluoranthene			21000		190		20	U	26	
Chrysene	1400	21000	42000		360		26		36	
Dibenz(a,h)anthracene	230	1900	10000	U	100	U	20	U	20	U
Fluoranthene	1700	30000	110000		1200		59		85	
Indeno(1,2,3-cd)pyrene	600	16000	24000		230		20	U	23	
Pyrene	2600	16000	140000		1400		62		83	
Total Benzofluoranthenes	3200	9900	40000		370		23		60	
Total HPAHs	12000	69000	452000		4410		212		344	
Phenols in µg/kg										
2,4-Dimethylphenol	29	210	3000	U	30	U	6	U	6	U
2-Methylphenol	63	77	3000	U	30	U	6	U	6	U
4-Methylphenol	670	3600	10000	U	100	U	20	U	20	U
Pentachlorophenol (PCP)	400	690	30500	U	305	U	61	U	61	U
Phenol	420	1200	10000	U	100	U	20	U	20	U
Phthalates in µg/kg										
Bis(2-ethylhexyl) Phthalate	8300		10000	U	100	U	300		430	
Butyl Benzyl Phthalate	970		10000	U	100	U	20	U	67	
Di-n-butyl Phthalate	5100		10000	U	100	U	20	U	20	U

Table 9 - Analytical Results for Sediment Samples; Willamette River Surface Sediment Samples

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	Grab 5 K9806351-005 9/14/98 0 to 10 cm	Grab 6 K9806351-006 9/14/98 0 to 10 cm	Grab 7 K9806351-007 9/14/98 0 to 10 cm	Grab 8 K9806351-008 9/14/98 0 to 10 cm
Di-n-octyl Phthalate	6200		10000 U	100 U	20 U	25
Diethyl Phthalate	1200		10000 U	100 U	20 U	20 U
Dimethyl Phthalate	1400		10000 U	100 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	50000 U	500 U	100 U	100 U
Benzyl Alcohol	57	870	3000 U	30 U	6	9
Dibenzofuran	540	1700	10000 U	100 U	20 U	20 U
Hexachlorobenzene	22	230	10000 U	100 U	20 U	20 U
Hexachlorobutadiene	29	290	10000 U	100 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	60000 U	60 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			14	3.3 U	3.3 U	3.3 U
4,4'-DDE			2.3 U	2.3 U	3.8	2.4
4,4'-DDT			11	6.7 U	6.7 U	6.7 U
Total DDT	6.9	69	25	6.7 U	3.8	2.4
Aldrin	10		1.7 U	1.7 U	1.7 U	1.7 U
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	10 U	10 U	10 U
Aroclor 1242			10 U	10 U	10 U	10 U
Aroclor 1248			10 U	10 U	10 U	10 U
Aroclor 1254			10 U	10 U	10 U	10 U
Aroclor 1260			10 U	10 U	10 U	10 U
Total PCBs	130	3100	10 U	10 U	10 U	10 U
Chlordane	10					
Dieldrin	10		2.3 U	2.3 U	2.3 U	2.3 U
Endosulfan I						
Endosulfan II						
Endosulfan Sulfate						
Endrin						
Endrin Aldehyde						
Endrin Ketone						
Heptachlor	10		1.7 U	1.7 U	1.7 U	1.7 U
Heptachlor Epoxide						
Methoxychlor						
Toxaphene						
alpha-BHC						
alpha-Chlordane			1.7 U	1.7 U	1.7 U	1.7 U
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)	10		1.7 U	1.7 U	1.7 U	2 U
gamma-Chlordane			1.7 U	1.7 U	1.7 U	1.7 U

Notes: Exceeds LCRMA SL

Exceeds LCRMA ML

SQLs Exceeds LCRMA SL

Table 9 - Analytical Results for Sediment Sampels; Willamette River Surface Sediment Samples

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	Grab-9 K9806410-004 9/15/98 0 to 10 cm	Grab-10 K9806410-005 9/15/98 0 to 10 cm	Grab-11 K9806410-006 9/15/98 0 to 10 cm	Grab-12 K9806410-007 9/15/98 0 to 10 cm
Conventionals						
Ammonia as Nitrogen			106 UJ/J	88.1 UJ/J	167 UJ/J	96.6 UJ/J
Carbon, Total Organic (TOC)			1.58	1.57	2.24	1.23
Solids, Total						
Solids, Total Volatile						
Sulfide, Total			3	3	39	4
Metals in mg/kg						
Antimony, Total	150	200	0.15 UJ/J	0.15 UJ/J	0.16 UJ/J	0.22 UJ/J
Arsenic, Total	57	700	2.4	2	2.3	2.1
Cadmium, Total	5.1	14	0.14	0.17	0.19	0.15
Chromium, Total			20.1	20.1	22.3	18.3
Copper, Total	390	1300	21.6 UJ/J	22 UJ/J	25.6 UJ/J	20.5 UJ/J
Lead, Total	450	1200	14.5	14.8	13.2	13.6
Mercury, Total	0.41	2.3	0.06	0.06	0.07	0.05
Nickel, Total	140	370	16.8	17.1	18	16.8
Silver, Total	6.1	8.4	0.22	0.23	0.29	0.22
Zinc, Total	410	3800	63.7	63.2	64.1	63.2
Organometallics in µg/L						
Tri-n-butyltin	0.15		0.02 U	0.02 U	0.02 U	0.02 U
LPAHs in µg/kg						
Acenaphthene	500	2000	20 U	20 U	20 U	20 U
Acenaphthylene	560	1300	20 U	20 U	20 U	20 U
Anthracene	960	13000	20 U	20 U	20 U	20 U
Fluorene	540	3600	20 U	20 U	20 U	20 U
Naphthalene	2100	2400	20 U	20 U	20 U	20 U
Phenanthrene	1500	21000	26	20	48	25
Total LPAHs	5200	29000	26	20	48	25
HPAHs in µg/kg						
Benz(a)anthracene	1300	5100	26	27	28	25
Benzo(a)pyrene	1600	3600	28	36	22	28
Benzo(b)fluoranthene			29	32	24	27
Benzo(g,h,i)perylene	670	3200	20 U	22	20 U	20 U
Benzo(k)fluoranthene			21	24	20 U	20
Chrysene	1400	21000	31	32	27	31
Dibenz(a,h)anthracene	230	1900	20 U	20 U	20 U	20 U
Fluoranthene	1700	30000	67	59	85	65
Indeno(1,2,3-cd)pyrene	600	16000	23	29	20 U	23
Pyrene	2600	16000	68	62	75	72
Total Benzofluoranthenes	3200	9900	50	56	24	47
Total HPAHs	12000	69000	293	323	261	291
Phenols in µg/kg						
2,4-Dimethylphenol	29	210	6 U	6 U	6 U	6 U
2-Methylphenol	63	77	6 U	6 U	6 U	6 U
4-Methylphenol	670	3600	20 U	20 U	20 U	20 U
Pentachlorophenol (PCP)	400	690	61 U	61 U	61 U	61 U
Phenol	420	1200	20 U	20 U	20 U	20 U
Phthalates in µg/kg						
Bis(2-ethylhexyl) Phthalate	8300		410	320	440	1000
Butyl Benzyl Phthalate	970		38	48	22	33
Di-n-butyl Phthalate	5100		20 U	20 U	20 U	20 U

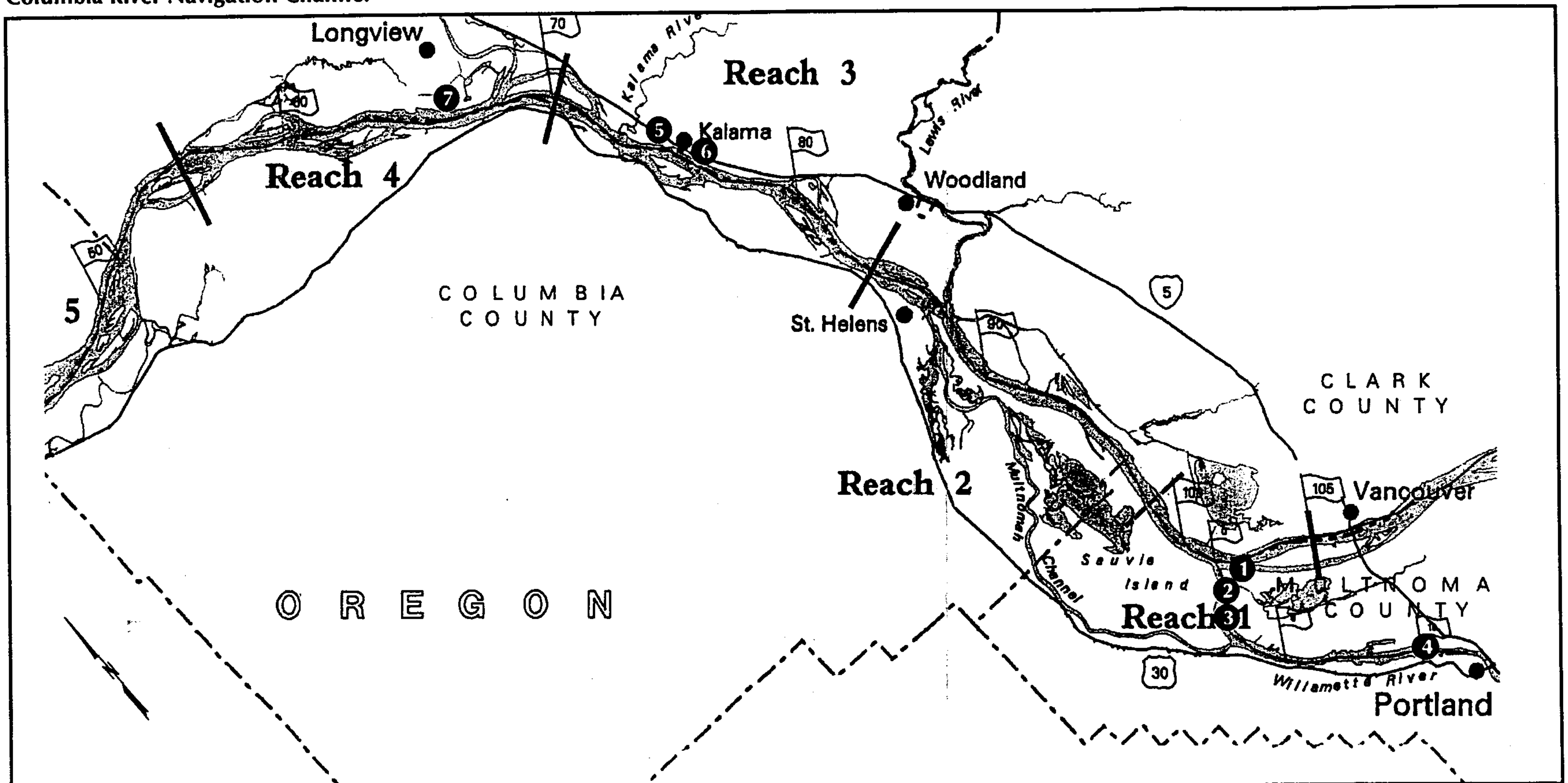
Table 9 - Analytical Results for Sediment Sampels; Willamette River Surface Sediment Samples

Sample ID Lab ID Sampling Date Sampling Depth Interval	LCRMA SL	LCRMA ML	Grab-9 K9806410-004 9/15/98 0 to 10 cm	Grab-10 K9806410-005 9/15/98 0 to 10 cm	Grab-11 K9806410-006 9/15/98 0 to 10 cm	Grab-12 K9806410-007 9/15/98 0 to 10 cm
Di-n-octyl Phthalate	6200		20 U	20 U	20 U	20 U
Diethyl Phthalate	1200		20 U	20 U	20 U	20 U
Dimethyl Phthalate	1400		20 U	20 U	20 U	20 U
Semivolatiles in µg/kg						
Benzoic Acid	650	760	100 U	100 U	100 U	100 U
Benzyl Alcohol	57	870	6 U	8	6 U	9
Dibenzofuran	540	1700	20 U	20 U	20 U	20 U
Hexachlorobenzene	22	230	20 U	20 U	20 U	20 U
Hexachlorobutadiene	29	290	20 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	28	130	12 U	12 U	12 U	12 U
Volatiles in µg/kg						
1,2-Dichlorobenzene	35	110	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	170		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	110	120	1 U	1 U	1 U	1 U
Pesticide/PCBs in µg/kg						
4,4'-DDD			2 U	2 U	2 U	2 U
4,4'-DDE			2 U	2 U	3	2 U
4,4'-DDT			2 U	2 U	2 U	2 U
Total DDT	6.9	69	2 U	2 U	3	2 U
Aldrin	10		2 U	2 U	2 U	2 U
Aroclor 1016			10 U	10 U	10 U	10 U
Aroclor 1221			10 U	10 U	10 U	10 U
Aroclor 1232			10 U	10 U	10 U	10 U
Aroclor 1242			10 U	10 U	10 U	10 U
Aroclor 1248			10 U	10 U	10 U	10 U
Aroclor 1254			10 U	10 U	10 U	10 U
Aroclor 1260			10 U	14	10 U	14
Total PCBs	130	3100	10 U	14	10 U	14
Chlordane	10					
Dieldrin	10		2 U	2 U	2 U	2 U
Endosulfan I			2 U	2 U	2 U	2 U
Endosulfan II			2 U	2 U	2 U	2 U
Endosulfan Sulfate			2 U	2 U	2 U	2 U
Endrin			2 U	2 U	2 U	2 U
Endrin Aldehyde			2 U	2 U	2 U	2 U
Endrin Ketone			2 U	2 U	2 U	2 U
Heptachlor	10		2 U	2 U	2 U	2 U
Heptachlor Epoxide			2 U	2 U	2 U	2 U
Methoxychlor			4 U	4 U	4 U	4 U
Toxaphene			40 U	60 U	70 U	70 U
alpha-BHC			2 U	2 U	2 U	2 U
alpha-Chlordane			2 U	2 U	2 U	2 U
beta-BHC			2 U	2 U	2 U	2 U
delta-BHC			2 U	2 U	2 U	2 U
gamma-BHC (Lindane)	10		2 U	2 U	2 U	2 U
gamma-Chlordane			2 U	2 U	2 U	2 U

Notes: Exceeds LCRMA SL

SQLs Exceeds LCRMA SL

General Location of Sampling Areas
Columbia River Navigation Channel



Note: Base map prepared from "Columbia River Dredged Material Management Study Overview Map".

Study Sites:

	Site	Port Facility	River
1	Terminal 6	Port of Portland	Columbia
2	Berth 501	Port of Portland	Willamette
3	Berth 401	Port of Portland	Willamette
4	Irving Street Terminal	Port of Portland	Willamette
5	Peavey Grain Terminal	Port of Kalama	Willamette
6	Harvest States Grain Terminal	Port of Kalama	
7	Longview Grain Wharf	Port of Longview	Columbia

4 0 4 8

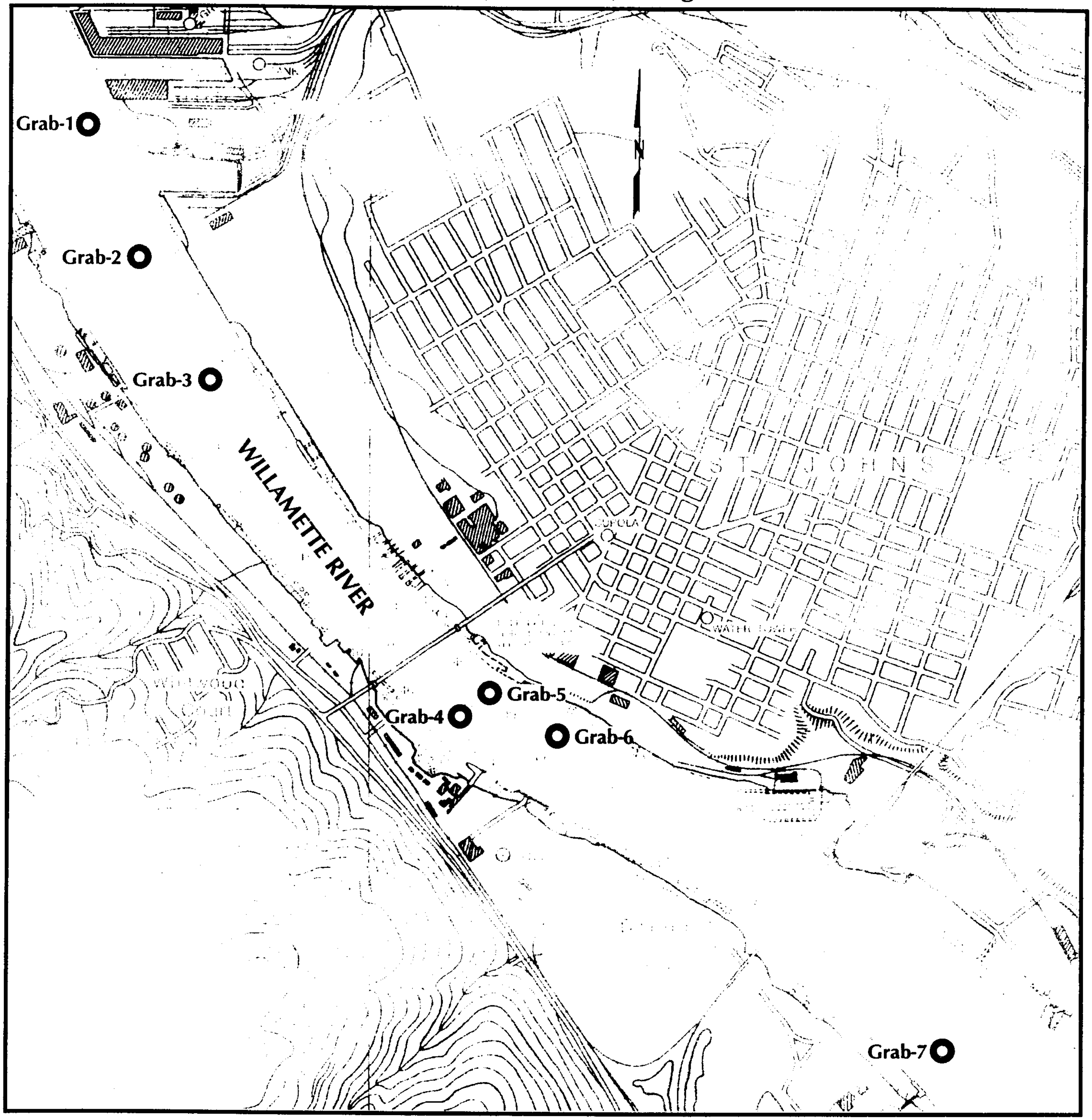
SCALE IN MILES

HARTCROWSER

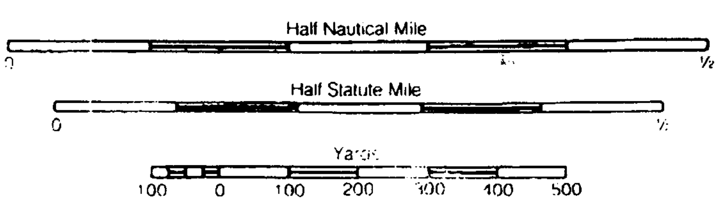
J-5760 8/98

Figure 1

General Location of Sampling Areas
Surface Sediments, Willamette River, Portland, Oregon



Note: Base map prepared from a Port of Portland map dated 4/98.



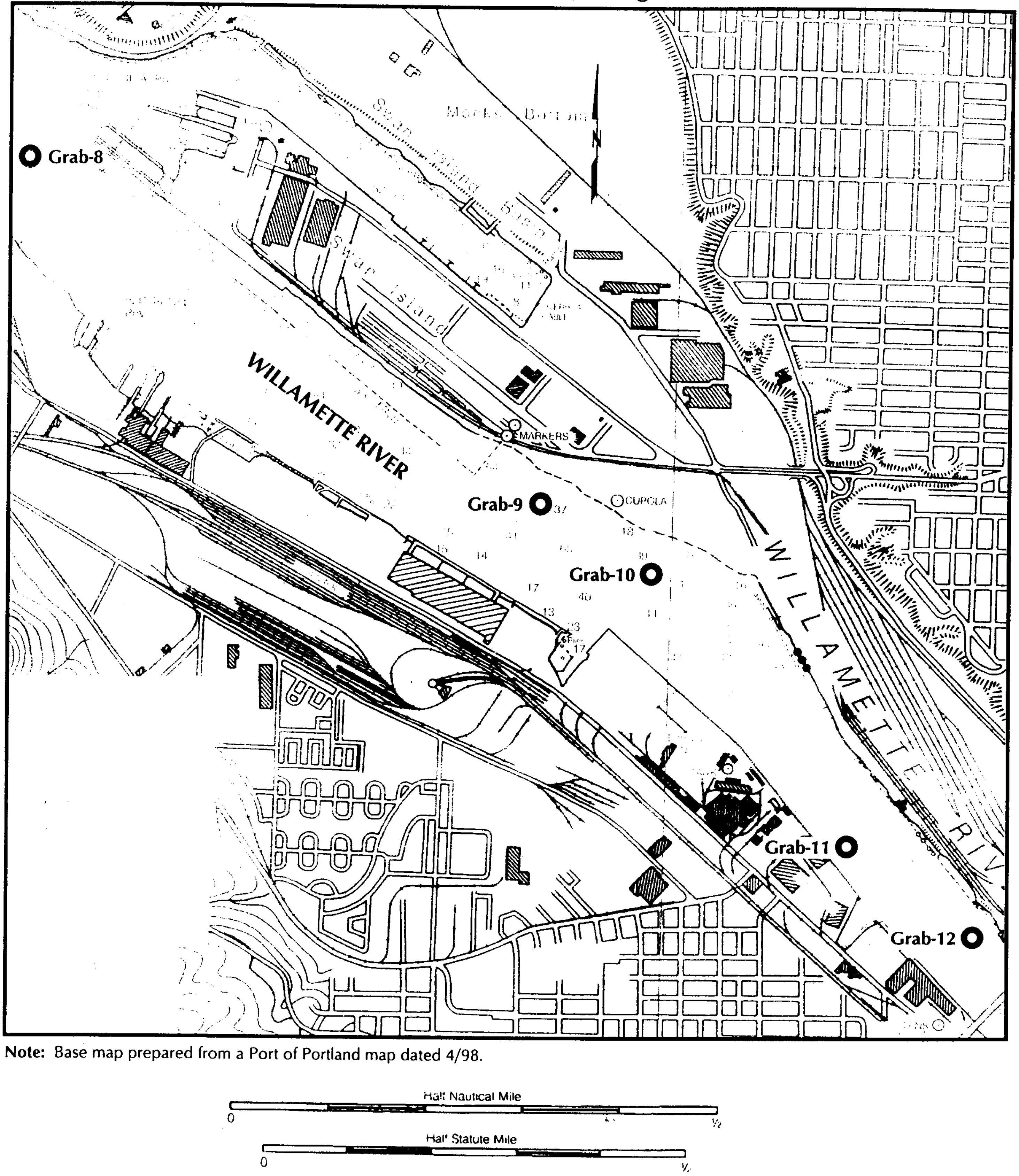
Legend:

Grab-3 ⭘ Approximate Grab Sample Location and Designation

HARTCROWSER
J-5760 12/98
Figure 2

General Location of Sampling Areas

Surface Sediments, Willamette River, Portland, Oregon



Note: Base map prepared from a Port of Portland map dated 4/98.

Legend:

Grab-8 ○ Approximate Grab Sample Location and Designation

HARTCROWSER
J-5760 **12/98**
Figure 3

APPENDIX A
CHEMICAL DATA QUALITY REVIEW

In total, 34 sediment samples, including two field duplicates, were collected between September 14, 1998 and September 17, 1998. The samples were submitted to Columbia Analytical Services, Kelso, Washington for analysis of the following:

- Total Metals (EPA Method 200.8/7471A);
- Semivolatile Organics (GC/MS SIM);
- Volatile Organics (EPA Method 8260B);
- Pesticides/PCBs (EPA Method 8081/8082);
- Tributyltin (TBT, GC/FPD);
- Total Organic Carbon (ASTM D4129-82M);
- Ammonia (EPA Method 350.1M);
- Sulfide (PSEP);
- Total Volatile Solids (EPA Method 160.4M); and
- Total Solids (EPA Method 160.3).

The following criteria were evaluated in the standard data quality review process for the results:

- Holding times;
- Method blanks;
- Reporting Limits;
- Surrogate recoveries;
- Blank spike and laboratory control sample (LCS) recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries; and
- Laboratory duplicates relative percent differences (RPDs).

Total Metals. All required holding times were met. Chromium, lead, nickel, silver, and zinc were detected below detection limits in method blanks. No qualifiers were assigned since sample concentrations were greater than five times blank contaminations. Cadmium was detected above detection limit in one method blank. Sample GRAB 6 was qualified as not detected (U). Reporting limits were elevated due to sample dilution. LCS recoveries were within laboratory control limits. The MS recoveries of antimony and copper were below laboratory control limits. Associated sample results were qualified as estimated (UJ/J). Laboratory duplicate RPDs were acceptable.

Semivolatile Organics. All required holding times were met. No method blank contamination was detected. Reporting limits were elevated due to sample dilution. Surrogate recoveries of 2-fluorophenol and 2,4,6-tribromophenol in the acid fraction were below laboratory control limits in method blanks, QC samples, and several project samples. Samples were reextracted and reanalyzed outside holding time by 42 to 45 days. Since reextraction grossly exceeded holding time criteria and demonstrated surrogates outside control limits were due to matrix interference, initial sample results were used. LCS and MS/MSD recoveries were within laboratory control limits.

Volatile Organics. All required holding times were met. No method blank contamination was detected. Reporting limits were elevated due to low percent solids in samples. Surrogate, LCS, and MS/MSD recoveries were within laboratory control limits.

Pesticides/PCBs. All required holding times were met. No method blank contamination was detected. Reporting limits were elevated due to matrix interference. Surrogate, LCS, and MS/MSD recoveries were within laboratory control limits.

Tributyltin. All required holding times were met. No method blank contamination was detected. Reporting limits were elevated due to insufficient sample provided for analysis. Surrogate recoveries of tri-n-propyltin were below laboratory control limits in method blank, QC sample, and several project samples. Samples HS-01-C1, PG-01-C1, and LG-01-C1 were qualified as estimated (UJ/J). LCS recoveries were acceptable. MS/MSD recoveries were below laboratory control limits due to severe emulsions during extraction. No qualifiers were assigned since LCS recoveries were acceptable.

Total Organic Carbon. All required holding times were met. No method blank contamination was detected. LCS and MS recoveries were acceptable. Laboratory duplicate RPD was within control limits.

Ammonia/Sulfide. All required holding times were met. No method blank contamination was detected. LCS and MS recoveries were within control limits. Laboratory duplicate RPD for ammonia was above laboratory control limits. Associated sample results in accession K9806410 were qualified as estimated (UJ/J).

Total Volatile Solids/Total Solids. All required holding times were met. No method blank contamination was detected. Laboratory duplicate RPDs were within control limits.